

PROCEEDINGS
OF THE
CALIFORNIA ACADEMY OF SCIENCES
FOURTH SERIES

Vol. XXXIX, No. 17, pp. 311-336; 6 figs.

August 9, 1973

THE BRACHYURAN CRABS OF EASTER ISLAND¹

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INTRODUCTION

Easter Island or Rapa Nui is a volcanic island lying in the eastern South Pacific at Latitude 27° 10' S. and Longitude 109° 26' W. (Cook Bay or Hanga-Roa). Roughly triangular in shape, it measures approximately 11 miles along its major dimension, from southwest to east, and approximately 8 miles along each of its two shorter legs. Each corner is dominated by a volcanic crater or shield, of which La Pérouse Mountain (Rana Hana Kana), near North Cape, is highest (1767 feet). The principal anchorages are at Cook Bay (Hanga-Roa) on the west side and La Pérouse Bay on the northeast side. Neither of these is protected in all weather and a ship must be prepared to up-anchor on an hour's notice, a circumstance that accounts in part for the infrequency with which the island has been visited by scientific parties. Of these only one is known to have made significant collections of marine animals: the *Albatross* Eastern Pacific Expedition of 1904-1905. According to Alexander Agassiz (1906, p. 56), expedition leader, "Considerable collecting was done at Easter Island . . . We collected a number of shore fishes, and made a small collection of the littoral fauna. The fishes have a decided Pacific look, and the few species of sea urchins . . . have a wide distribution in the Pacific." The Brachyura of this expedition were reported on by Rathbun (1907), who listed the following six species from Easter Island:

¹ Allan Hancock Foundation Contribution No. 345.

- XANTHIDAE: *Pseudoliomera remota* (Rathbun)
Trapezia ferruginea Latreille.
- GRAPSIDAE: *Leptograpsus variegatus* (Fabricius)
Pachygrapsus transversus (Gibbes)
Ptychognathus easteranus Rathbun
Plagusia dentipes (De Haan).

The Heyerdahl Expedition of 1955–1956 collected a single brachyuran on Easter Island. Not hitherto reported, it is included herewith:

- GRAPSIDAE: *Geograpsus crinipes* (Dana).

The Medical Expedition to Easter Island (METEI) visited the island in 1964–1965. Collections of brachyuran crabs were made from late December to early February at the following localities: on the north side of the island at Anakena Bay; on the west side of the island at Hanga-Roa, Hanga-piko, and Mataveri (inland from Hanga-piko); on the south side of the island at Vaihu. Most of the collecting was intertidal, but that at Anakena was in water of 20–25 foot depth. Specimens were collected by rotenone poisoning at Vaihu, and the stomach of a large starfish from an unknown locality yielded crabs of the genus *Trapezia*, usually associated with corals. Except where noted, as in the case of children and islanders, who provided native names for crabs, all collecting was done by Ian E. Efford and Jack A. Mathias.

Fourteen species of brachyuran crabs are included in the METEI collection, a number double that obtained by earlier expeditions. Among the 14 are all previously collected species except *Pseudoliomera remota*, obtained by the Albatross Expedition, and *Geograpsus crinipes*, obtained by the Heyerdahl Expedition. A second specimen of *Ptychognathus easteranus* of the opposite sex from the unique holotype was collected. The number of crab families known from Easter Island was increased from two to four with the addition of the Dromiidae and Portunidae; the number of genera was increased from seven to twelve with the addition of *Dromidia*, *Portunus*, *Carpilius*, *Chlorodiella*, and *Cyclograpsus*; and among the seven species new to the island is a second species of *Plagusia* new to science.

The Expedición Isla de Pascua (EIP) of the Instituto Central de Biología, Universidad de Concepción, Chile, visited the island in August, 1972. Collections of brachyuran crabs were made intertidally at Anakena Bay, Hanga-Roa, and Hotu-Iti by H. I. Moyano, at Tahai by T. Cekalović, and by diving in 8–10 meters by V. A. Gallardo. Specimens were sent to the author for identification in November, 1972, by M. A. Retamal, who has kindly permitted incorporation of the new records in the present manuscript.

Included in the EIP collection are twelve species of brachyuran crabs. Among them are five species also collected by the METEI and one species collected

by the Heyerdahl Expedition. The remaining six species include five widely ranging Indo-west Pacific species not previously known from Easter Island and one that appears to be new to science. The number of genera known from Easter Island is increased from twelve to sixteen with the addition of *Thalamita*, *Etisus*, *Liomera* (= *Carpilodes*), and *Lophozozymus*. Description of the new species will appear subsequently in a Chilean journal, at Professor Retamal's request.

The astute carcinologist will note that two large groups of Brachyura, the Oxy stomata and the Oxyrhyncha, are lacking from Easter Island collections made to date, the list being composed entirely of Dromiacea and Brachyrhyncha. It may be confidently predicted that when present terrestrial and intertidal collecting is extended to include the subtidal, representatives of these groups will be added; for while a few oxystomatous and oxyrhynchous crabs occur in weeds and among corals in the tropical Pacific, more are to be found by shallow dredging.

HISTORICAL NOTE

Through the research of Dr. L. B. Holthuis of the Royal Netherlands Museum of Natural History, Leiden, I am able to mention what is probably the oldest observation of crabs on Easter Island. It is found in the account of Don Juan Hervé, first pilot or senior navigating officer of the *San Lorenzo*, one of two vessels comprising the expedition to the islands under Don Felipe González in 1770 (Hervé, 1908, p. 122), as reprinted in the Works of the Hakluyt Society, transcribed and edited by B. G. Corney. In the description of the small, rocky islets at the southwest tip of the island, now known as Needle Rock or Motukaokao and Flat Rock or Motu-nui, is the statement: "We passed on to the outer one, where we succeeded in landing, and on which we found two large masses of seaweed, many black flints, some sea urchins and small crabs, eggs of seagulls and their fledglings . . ." It is tempting to speculate, in the light of METEI findings, what these small crabs might have been.

ACKNOWLEDGMENTS

When preparing the account of the brachyuran decapod Crustacea of Chile a decade and a half ago (Garth, 1957) it was realized that this work was incomplete in that coverage of the Chilean Isla de Pascua, as Easter Island is known to the Spanish-speaking world, was lacking. Since no new specimen material was then available, as in the case of Juan Fernandez Island, it was thought better to await the arrival of fresh collections than to redescribe the older ones. Such an opportunity presented itself with the extensive collections made by Ian E. Efford and Jack A. Mathias on the Medical Expedition to Easter

Island, and to them the author is indebted for the privilege of extending his knowledge of the Chilean fauna to this island outpost of the Pacific.

Inclusion in the present report of the single specimen of brachyuran crab collected at Easter Island by the Heyerdahl Expedition of 1955–1956 was made possible through the courtesy of Mr. Nils Knaben of the Oslo Museum, with Dr. L. B. Holthuis of the Leiden Museum facilitating arrangements.

Inclusion in the present report of the Easter Island collections of the Instituto Central de Biología, Universidad de Concepción, Chile, was made possible through the kindness of Prof. M. A. Retamal.

The writer is indebted to Mme. Danièle Guinot of the Muséum National d'Histoire Naturelle, Paris, for identifying the *Chlorodiella* species from Easter Island, and to Dr. T. Sakai of Kamakura, Japan, for confirming the identity of *Plagusia dentipes* from Easter Island with Japanese specimens. He wishes to thank Dr. C. B. Goodhart of the Museum of Zoology of Cambridge University, Cambridge (see Garth, 1971), for permission to examine specimens of *Pseudoliomera remota* and *P. lata* from the Indian Ocean, and Dr. L. B. Holthuis of the Rijksmuseum van Natuurlijke Historie, Leiden, and Mr. J. Forest of the Muséum National d'Histoire Naturelle, Paris, for permission to examine the type-specimens of *Plagusia* species at their respective institutions.

Consultation of type-specimens in European museums was made possible by a grant from the National Science Foundation (GB-3849). Illustration of the new species of *Plagusia* was provided by a grant from the Research and Publication Fund (National Defense Education Act) of the University of Southern California.

The sponge covering of *Dromidia* was identified by Dr. Gerald J. Bakus of the University of Southern California. The coral hosts of *Trapezia* species were identified by Dr. John W. Wells of Cornell University and the star fish from the stomach of which *Trapezia* species were recovered was identified by Mr. James Clark of Harvard University. Dr. F. A. Chace, Jr. of the U. S. National Museum reviewed the manuscript and made valuable suggestions.

ACCOUNT OF SPECIES

RESTRICTION OF SYNONYMIES. The synonymies that follow are restricted to the original description, the first use of the name in its present combination, a good illustration if not included in the above two, the first record from Easter Island, and, in order to provide documentation for the zoogeographical discussion to follow, records from adjacent Pacific islands from which the species might have migrated to Easter Island. In cases of involved synonymies, reference is made to one of the regional monographs, such as Alcock (1900), Edmondson (1922, 1954, 1959, 1962), Forest & Guinot (1961), Ihle (1913), Rathbun (1906, 1918, 1930), or Sakai (1936, 1939).

LIST OF SPECIES

	Alba- tross 1904- 1905	Heyer- dahl 1955- 1956	METE1 1964- 1965	EIP 1972
DROMIACEA				
DROMIIDAE				
<i>Dromidia unidentata</i> (Rüppell).			X	
BRACHYGNATHA-BRACHYRHYNCHA				
PORTUNIDAE				
<i>Portunus pubescens</i> (Dana)			X	
<i>Thalamita</i>				X
XANTHIDAE				
<i>Carpilius convexus</i> (Forskål)			X	
<i>Liomera rugata</i> (Milne Edwards)				X
<i>Actaea parvula</i> (Krauss)				X
<i>Pseudoliomera remota</i> (Rathbun)	X			
<i>Lophozozymus dodone</i> (Herbst)				X
<i>Etisus electra</i> (Herbst)				X
<i>Chlorodiella cytherea</i> (Dana)			X	X
<i>Trapezia areolata</i> Dana			X	X
<i>Trapezia cymodoce</i> (Herbst)			X	X
<i>Trapezia danai</i> Ward (= <i>maculata</i> Dana)				X
<i>Trapezia ferruginea</i> Latreille	X		X	
<i>Species incertae sedis</i> . ²			X	X
GRAPSIDAE				
<i>Geograpsus crinipes</i> (Dana)		X		X
<i>Leptograpsus variegatus</i> (Fabricius)	X		X	X
<i>Pachygrapsus transversus</i> (Gibbes)	X		X	
<i>Ptychognathus casteranus</i> Rathbun	X		X	
<i>Cyclograpsus longipes</i> Stimpson			X	
<i>Plagusia dentipes</i> De Haan	X		X	
<i>Plagusia integripes</i> Garth, new species			X	
	6	1	14	12

² One small xanthid obtained by the METE1 is unreported pending further study.

Section BRACHYURA
Subsection DROMIACEA
Superfamily DROMIIDEA
Family DROMIIDAE

***Dromidia unidentata unidentata* (Rüppell).**

Dromia unidentata RÜPPELL, 1830, p. 16, pl. 4, fig. 2; pl. 6, fig. 9 (Red Sea); ALCOCK, 1900, p. 139, literature; CHILTON, 1911, p. 554 (Kermadec Islands).

Dromidia unidentata, KOSSMANN, 1880, p. 67; IHLE, 1913, p. 31 (New Guinea), synonymy; SAKAI, 1936, p. 13, pl. 6, fig. 2; text-figs. 2a, b (Japan).

MATERIAL EXAMINED. Anakena, Easter Island, METEI Station F 85, 20-25 feet, 15 January 1965, 1 male, Ian E. Efford and Jack A. Mathias. The crab was covered by a sponge identified as *Hymeniacidon* species by Dr. Gerald J. Bakus.

MEASUREMENTS. Male specimen: length of carapace 13.4 mm., width 11.3 mm.

DISTRIBUTION. From Red Sea and East Africa to New Guinea and Japan; Kermadec Islands and, as subspecies *D. u. hawaiiensis* Edmondson (1922, p. 34), Hawaii.

REMARKS. The Easter Island specimen allies itself with the widely distributed Indo-west Pacific subspecies, rather than with the Hawaiian subspecies described by Edmondson (1922, p. 34). The only other South Pacific record is from Meyer Island in the Kermadec Islands (Chilton, 1911), which lie northeast of New Zealand in Latitude 30° S., a few degrees more southerly than Easter Island. Other islands lying south of the Tropic of Capricorn and, together with Rapa Nui (Easter) and Sala y Gomez, completing an arc to San Felix and San Ambrosio off the coast of Chile are Rapa, Morotiri (Bass), Pitcairn, Henderson, and Ducie.

Subsection BRACHYGNATHA
Superfamily BRACHYRHYNCHA
Family PORTUNIDAE

***Portunus pubescens* (Dana).**

Lupa pubescens DANA, 1852b, p. 274; 1855, pl. 16, fig. 9 (Sandwich Islands).

Portunus pubescens, RATHBUN, 1906, p. 870, pl. 14, fig. 1; EDMONDSON, 1923, p. 22 (Palmyra);

STEPHENSON and CAMPBELL, 1959, p. 99, figs. 2C, 3C, pl. 1, fig. 3; pls. 4C, 5C, synonymy. *Neptunus pubescens*, SAKAI, 1934, p. 303 (Japan).

Neptunus tomentosus HASWELL, 1882, p. 547 (Australia).

MATERIAL EXAMINED. Hanga-Roa, near camp, January 1965, 1 female, Ian E. Efford and Jack A. Mathias.

MEASUREMENTS. Female specimen: length of carapace 28.0 mm., width including lateral spines 44.6 mm., without spines 39.0 mm.

DISTRIBUTION. Australia, Japan, Hawaii, and Line Islands (Palmyra). The early record from Port Jackson, New South Wales, is based on Stephenson and Campbell's synonymy of *Neptunus tomentosus*.

REMARKS. The occurrence at Easter Island of *Portunus pubescens*, until recently known only from the north Central Pacific and Japan, becomes more plausible with the establishment of its identity with the Australian *P. tomentosus* and its recognition as a southern hemisphere species, Easter Island being in the Latitude of Brisbane. It is probable that *P. pubescens* occurs widely throughout the South Pacific but has not been reported because of insufficient collecting. Traces of reddish brown color remain on the metagastric and epibranchial regions after three and a half years in alcohol.

Family XANTHIDAE

Carpilius convexus (Forskål).

Cancer convexus FORSKÅL, 1775, p. 88 (Red Sea).

Carpilius convexus RÜPPELL, 1830, p. 13, pl. 3, fig. 2; pl. 6, fig. 6 (Tahiti); DANA, 1852b, p. 159; 1855, pl. 7, fig. 5 (Sandwich Islands); RATHBUN, 1907, p. 37 (Tuamotu); BOONE, 1934, p. 89, pls. 43-45, synonymy; BARNARD, 1950, p. 205 (Durban); EDMONDSON, 1962, p. 223, fig. 1b; GARTH, 1965, p. 16, figs. 8 (male pleopods), 13 (Clipperton Island).

MATERIAL EXAMINED. Anakena, Station M 5, 1 meter, 23 December 1964, 2 females, collected by islanders. Mataverí, Station M 41, 21 January 1965, 1 female, Ian E. Efford and Jack A. Mathias.

MEASUREMENTS. Specimens, all females, measured 62.8×85.4 , 70.7×95.1 , and 73×96 mm. in length and width of carapace, respectively.

DISTRIBUTION. From the Red Sea and South Africa to Hawaii, Tahiti, and Tuamotu. Clipperton Island.

REMARKS. The color of the Easter Island specimens resembled nothing that this writer has encountered previously with this or any other brachyuran species. It was as if each specimen had been dipped, like an Easter egg, in a series of dyes: orange, pink, and blue, while being held each time by a different appendage. The result was a piebald appearance of utmost irregularity that could not be called a pattern. Suspecting some artifact in the preserving process, the writer queried Ian E. Efford, but was assured that this was their natural coloring before preservation. The native name for this spectacular crab is Pikea Tutuau.

Widely distributed throughout the Indo-west Pacific, *Carpilius convexus* has now been reported twice from the eastern Pacific, once at Clipperton Island and now at Easter Island, in the same Longitude, 109° W. Some 37° of Lat-

itude, or 2,200 nautical miles, separate the two localities. The genus occurs also in the western Atlantic, but is absent from the American west coast.

***Liomera rugata* (Milne Edwards).**

Carpilodes rugatus, A. MILNE EDWARDS, 1865, p. 230, pl. 12, figs. 3, 3a, 3b; ORTMANN, 1893, p. 468 (Tahiti); ODHNER, 1925, p. 20, pl. 1, fig. 16 (Gilbert Islands); EDMONDSON, 1962, p. 249, fig. 9a, synonymy.

Carpilodes monticulosus, RATHBUN, 1906, p. 884 (Hawaii); 1907, p. 37 (Tuamotu). [Not *C. monticulosus* A. Milne Edwards.]

Liomera rugatus, BARNARD, 1950, p. 237.

MATERIAL EXAMINED. Hotu-iti, 8 August 1972, one female, H. I. Moyano, EIP.

MEASUREMENTS. Female specimen, length of carapace 12.2 mm., width 21.4 mm.

DISTRIBUTION. From Red Sea and Mauritius to Tahiti, Tuamotu, and Hawaii.

REMARKS. This common Indo-west Pacific species has been confused with *Liomera monticulosa* (A. Milne Edwards) by such authorities as Borradaile (1902) and Rathbun (1907), according to Odhner (1925), whose figure is the basis for our identification.

***Actaea parvula* (Krauss).**

Menippe parvulus KRAUSS, 1843, p. 34, pl. 2, figs. 2, a-c (Natal).

Actaea parvula, LENZ, 1910, p. 549 (Madagascar); ODHNER, 1925, p. 51, pl. 3, fig. 13 (Galle, Ceylon; Fiji; Marquesas); BARNARD, 1950, p. 234, text-fig. 43, g, h (Delgoa Bay), synonymy.

MATERIAL EXAMINED. Anakena Bay, 9 August 1972, 2 males, one ovigerous female, H. I. Moyano, University of Concepción, Chile.

MEASUREMENTS. Male specimens, 8.9×11.7 and 10.5×14.1 mm.; ovigerous female specimen 11.5×15.5 mm. in length and breadth of carapace, respectively.

COLOR IN ALCOHOL. Carapace yellow, with red-orange blotches on gastric and hepatic regions (three blotches in all). Chelipeds and legs yellow, fingers white with brown pigment visible beneath the surface. Hairs golden.

REMARKS. Easter Island specimens were compared with a 9.3×12.5 mm. female collected by the writer at Galle, Ceylon, in 1964, which had in turn been compared with specimens in the British Museum (Natural History), also from Galle, Ceylon, identified by T. Odhner. The salient, tridentate tooth on the immovable finger of the chela is characteristic of the species.

***Pseudoliomera remota* (Rathbun).**

Actaea remota RATHBUN, 1907, p. 43, pl. 1, fig. 9; pl. 7, fig. 1 (Easter Island); 1911, p. 217 (Salomon, Coetivy); ODHNER, 1925, p. 63 (Hilo, Hawaii); SAKAI, 1939, p. 490, pl. 93, fig. 4 (Tosa Bay); GUINOT, 1962, p. 237, figs. 8, 9 (Maldive Islands).

Actaea nana KLUNZINGER, 1913, p. 86 (Koseir, Red Sea).

Pseudoliomera remota, GUINOT, 1967, p. 561; 1969, p. 228.

PREVIOUS COLLECTION. Easter Island, shore, 20 December 1904, 1 male, *Albatross* (Rathbun, 1907).

MATERIAL EXAMINED. None from among METEI collections. Through the kindness of Dr. C. B. Goodhart of the University Museum of Zoology, Cambridge, it was possible to examine the young female from Salomon collected by the *Sealark*.

MEASUREMENTS. Young female: length of carapace 4.0 mm., width 4.6 mm. The holotype male (USNM no. 32849) measures 6.0 mm. in length and 8.7 mm. in width of carapace (Rathbun, 1907).

DISTRIBUTION. Red Sea and western Indian Ocean to Japan, Hawaii, and Easter Island. The west Australian record (Guinot, 1962, fig. 9) is an error of provenience resulting from a confusion of names between the Eastern Islands of the Houtman Abrolhos group in the eastern Indian Ocean and Easter Island (Île de Pâques) in the eastern South Pacific. A Christmas Island also exists in both eastern Indian and central Pacific oceans further to confound the zoogeographer.

REMARKS. As noted from the Indian Ocean specimen examined, *Pseudoliomera remota* is a patterned species with the inner protogastric areoles broadly continuous with the front and the outer protogastric areoles discontinuous with the inner orbital areoles. The fingers resemble those of *Pseudoliomera lata* (Borradaile) from the Maldive Islands (see Garth, 1971), also seen at Cambridge University (*cf.* Guinot, 1962, figs. 6 and 8). The synonymy of *Actaea nana* Klunzinger (*cf.* Odhner, 1925) permits the inclusion of the Red Sea in the already extended longitudinal range of the species.

Lophozozymus dodone (Herbst).

Cancer dodone HERBST, 1801, p. 37, pl. 52, fig. 5 (East Indies).

Atergatis elegans HELLER, 1862, p. 519; 1865, p. 7, pl. 1, fig. 3 (Tahiti).

Lophozozymus dodone, ALCOCK, 1898, p. 108 (Andaman); BALSS, 1938, p. 39 (Fiji, Tahiti).

FOREST and GUINOT, 1961, p. 54, text-figs. 39a, b (Tahiti), synonymy.

MATERIAL EXAMINED. Anakena Bay, shore, 9 August 1972, 1 male, H. I. Moyano, University of Concepción Expedition.

MEASUREMENTS. Male specimen: length of carapace 6.1 mm., width 9.2 mm.

DISTRIBUTION. From South Africa to Hawaii and Tahiti.

REMARKS. The Easter Island specimen was compared with a specimen from Hawaii of like size and sex. The slight discrepancies noted are believed to lie within the normal range of variation for this widely ranging Indo-west Pacific species.

***Etisus electra* (Herbst).**

Cancer electra HERBST, 1801, p. 34, pl. 51, fig. 6 (East Indies).

Etisus rugosus JACQUINOT, 1852, pl. 4, fig. 2; 1853, p. 33 (Tuamotu).

Etisodes sculptilis A. MILNE EDWARDS, 1873, p. 236, pl. 9, fig. 2 (New Caledonia).

Etisus electra, NOBILI, 1907, p. 390 (Tuamotu); RATHBUN, 1907, p. 42 (Tuamotu, Gilbert Islands); FOREST and GUINOT, 1961, p. 89, figs. 82a, b (Tahiti), synonymy.

Etisus electra, BARNARD, 1950, p. 245, figs. 45a, b (South Africa); GUINOT, 1964, p. 59.

Etisus (Etisodes) electra, HOLTHUIS, 1953, p. 21 (Marianas, Gilbert Islands).

MATERIAL EXAMINED. Anakena Bay, sand, 9 August 1972, 1 male, 1 young, H. I. Moyano, University of Concepción, Chile.

MEASUREMENTS. Male specimen, length of carapace 5.4 mm., width 6.8 mm.

DISTRIBUTION. From the Red Sea and Mozambique (Delgoa Bay) to Tahiti and Tuamotu (Manga Reva).

REMARKS. The Easter Island specimens compare with the figure of *Etisodes sculptilis* A. Milne Edwards, a synonym of *Etisus electra* (Herbst), according to Guinot (1964). The far-flung distribution of this small xanthid makes it a likely colonizer of island outposts like Easter.

***Chlorodiella cytherea* (Dana).**

Chlorodius cytherea DANA, 1852a, p. 79; 1852b, p. 213; 1855, pl. 12, figs. 2a-c (Tuamotu and Hawaii).

Chlorodiella cytherea, HOLTHUIS, 1953, p. 14 (Marianas and Gilbert islands); FOREST and GUINOT, 1961, p. 95, figs. 90-92, 98a, b (Tahiti), synonymy.

MATERIAL EXAMINED. Hanga-piko, tide pool, Station M 10, 31 December 1964, 1 ovigerous female, Ian E. Efford and Jack A. Mathias. Anakena Bay, on the beach, 9 August 1972, 1 young male, H. I. Moyano, EIP.

MEASUREMENTS. Female specimen: length of carapace 6.1 mm., width 9.6 mm.

DISTRIBUTION. From the Red Sea and Madagascar to Hawaii, Tahiti, and Tuamotu.

REMARKS. With the recognition by Holthuis (1953) of *Chlorodiella cytherea* among Pacific coral atoll collections and its reestablishment by Forest and Guinot (1961) upon firm morphological characters, it becomes possible to distinguish four common *Chlorodiella* species in the Indo-west Pacific, the others being *C. laevissima* (Dana), with which the present species was formerly confused, *C. nigra* (Forskål), and *C. barbata* (Borradaile). The Easter Island specimen was seen and its identification confirmed by Mme. D. Guinot of the Paris Museum.

***Trapezia areolata* Dana.**

Trapezia areolata DANA, 1852a, p. 83; 1852b, p. 259; 1855, pl. 15, fig. 8a (Tahiti); FOREST and GUINOT, 1961, p. 135, fig. 133 (Hikueru).

Trapezia ferruginea areolata, ORTMANN, 1897, p. 206, synonymy.

Trapezia reticulata STIMPSON, 1858, p. 37.

MATERIAL EXAMINED. Hanga-piko, 2 February 1965, 2 males, 2 ovigerous females, collected by Norma (METEI). No station or date, 2 males, from the stomach of a large starfish collected by Ian E. Eiford and Jack A. Mathias and identified as *Lciaster leachii* by James Clark of Harvard University. SCUBA diving, coral reef, 8-10 meters, 8-9 August 1972, 1 male, V. A. Gallardo, EIP.

MEASUREMENTS. Males measure 9.3×10.7 , 9.5×10.8 , 9.6×10.9 , and 12.1×13.7 mm., ovigerous females 9.8×12.2 and 12.1×15.0 mm. in length and width, respectively.

DISTRIBUTION. From Ceylon and the Nicobar Islands to Tahiti and Tuamotu (Hikueru = Melville Island).

REMARKS. The large starfish from whose stomach the two males were collected, along with four specimens of *Trapezia ferruginea* Latreille, was presumably feeding on the corals with which the *Trapezia* species are invariably associated throughout their extensive range.

Trapezia cymodoce (Herbst).

Cancer cymodoce HERBST, 1801, p. 22, pl. 51, fig. 5 (East Indies).

Trapezia cymodoce, GERSTAECKER, 1857, p. 125; ORTMANN, 1897, p. 203, synonymy: EDMONDSON, 1923, p. 20 (Palmyra).

Grapsillus cymodoce, RATHBUN, 1906, p. 685, pl. 11, fig. 6 (Hawaii).

Trapezia hirtipes JACQUINOT and LUCAS, 1853, p. 44, pl. 4, fig. 14 (Marquesas).

MATERIAL EXAMINED. Hanga-piko, 2 February 1965, 1 ovigerous female without chelipeds, collected by Norma (METEI).

MEASUREMENTS. Ovigerous female: length of carapace 8.5 mm., width 10.8 mm.

DISTRIBUTION. From the Red Sea and Dar-es-Salaam to Tahiti and the Marquesas. Hawaii and the Line Islands (Palmyra).

REMARKS. Although no mention is made of an invertebrate host, the *Trapezia* species are customarily collected by cracking large heads of *Pocillopora* coral, of which three species, *P. damicornis*, *P. danac*, and *P. diomedac*, occur at Easter Island, according to Dr. John W. Wells of Cornell University. *Trapezia cymodoce* is most readily distinguished from *T. ferruginea* by the fine woolly hair on the outer side of the palm of the cheliped. In the absence of chelipeds, reliance may be placed in the lateral teeth of the carapace, which are pointed even in grown specimens, according to Ortmann (1897).

Trapezia danai Ward.

Trapezia maculata DANA, 1852b, p. 256 (part); 1855, pl. 15, fig. 4d (not 4a-c); STIMPSON, 1860, p. 219 (Socorro Island). [Not *Grapsillus maculatus* MacLeay.]

Trapezia danae WARD, 1939, p. 13, figs. 17, 18. [Name substituted for *T. maculata* Dana, preoccupied by *T. maculata* (MacLeay).]

Trapezia aff. *danae*, SERÈNE, 1969, p. 136, figs. 14A, 14B, 15, 16, 21, 22, 24.

MATERIAL EXAMINED. Easter Island, 8–10 meters, SCUBA diving, 9–10 August 1972, one female, V. A. Gallardo, EIP.

MEASUREMENTS. Female specimen, length of carapace 8.5 mm., width 10.8 mm.

DISTRIBUTION. Western Pacific at Samoa, Tahiti, and Hawaii; eastern Pacific doubtfully at Socorro Island; specimens sent to Stimpson by John Xantus probably were from Hawaii also.

REMARKS. Since Dana's material probably contained more than one species (Serène, 1969), it is with some hesitation that the name now applied to one of them is used here, as it is by no means certain that the Easter Island specimen, a female, is identical with either the Hawaiian or Tahitian specimens figured by Dana (1855). For the present, it can only be said that Easter Island supports a finely spotted species of *Trapezia* resembling both *T. danai* Ward and *T. wardi* Serène, yet differing in some particulars from each of them. A series of specimens, including males, will be needed to resolve the question.

Trapezia ferruginea Latreille.

Trapezia ferruginea LATREILLE, 1825, p. 695 (Red Sea); ORTMANN, 1897, p. 205, synonymy. *Trapezia cymodoce ferruginea*, RATHBUN, 1907, p. 58 (Easter Island); 1930, p. 557, pl. 228, figs. 1, 2 (Clarion Island); BOONE, 1927, p. 240, text-fig. 88 (Galápagos Islands); HERTLEIN and EMERSON, 1957, p. 5 (Clipperton Island).

Trapezia miniata JACQUINOT and LUCAS, 1853, p. 43, pl. 4, fig. 10 (Marquesas).

PREVIOUS COLLECTION. Easter Island, shore, 20 December 1904, 1 male, 1 ovigerous female, *Albatross* (Rathbun, 1907).

MATERIAL EXAMINED. Easter Island, without precise locality or date, 3 males, 1 ovigerous female, from the stomach of a large starfish collected by Ian E. Efford and Jack A. Mathias and identified as *Leiaster leachii* by James Clark.

MEASUREMENTS. Males measure from 7.5×8.4 to 12.3×14.4 mm., ovigerous female 8.7×11.4 mm. in length and width, respectively.

DISTRIBUTION. From the Red Sea and Zanzibar to Hawaii and the Marquesas in the western Pacific; Clarion, Clipperton, Easter, and Galápagos islands in the eastern Pacific; from the Gulf of California to Colombia on the American mainland.

REMARKS. *Trapezia ferruginea* is one of two Indo-Pacific species of *Trapezia* known to occur on the west coast of tropical America, *T. digitalis* Latreille being the other (Rathbun, 1930). Both are inhabitants of the *Pocillopora* coral colony but, whereas *T. ferruginea* is bright red, *T. digitalis* is a somber brown. The latter species was not found among METEI collections, nor has it been reported from Easter Island. Rathbun, (1907), who considered *T. ferruginea* a subspecies of *T. cymodoce* (Herbst), noted that the chelipeds of Easter Island specimens were covered with fine spots.

Family GRAPSIDAE

Geograpsus crinipes (Dana).

Grapsus crinipes DANA, 1851, p. 249; 1852b, p. 341; 1855, pl. 21, figs. 6a-d (Sandwich Islands). *Geograpsus crinipes*, ORTMANN, 1894, p. 706 (Samoa); DE MAN, 1895, p. 83, pl. 28, figs. 17a-c; EDMONDSON, 1923, p. 10 (Fanning, Palmyra); 1959, p. 162, fig. 4a; SAKAI, 1939, p. 652, pl. 107, fig. 2 (Japan), synonymy.

MATERIAL EXAMINED. Poike, eastern peninsula of Easter Island, in a hole at an altitude of 250 m., 24 February 1956, 1 male, Thor Heyerdahl, collector (Oslo Museum). Tahai, 4 August 1972, T. Cekalović, EIP.

MEASUREMENTS. Male specimens: 38.7×45.1 and 47×55 mm., in length and breadth of carapace, respectively.

DISTRIBUTION. Throughout the Indo-west Pacific from the Red Sea and Zanzibar to Japan, Samoa, Hawaii, and the Line Islands (Fanning, Palmyra).

REMARKS. The male specimen collected by the Heyerdahl Expedition lived for 19 days, or until 14 March 1956. It is not known whether the hole in which it was found contained water, or if so, whether this was fresh or brackish. The altitude at which the Easter Island specimen was collected serves to underscore the terrestriality of the species. In the Marshall Islands, which are low islands, *Geograpsus crinipes* occurs among litter on the forest floor and is seldom seen by day except when accidentally disturbed.

The Oslo Museum specimen was identified by Dr. L. B. Holthuis of the Leiden Museum, who kindly forwarded the essential information for inclusion.

Leptograpsus variegatus (Fabricius).

Cancer variegatus FABRICIUS, 1793, p. 450.

Leptograpsus variegatus, MILNE EDWARDS, 1853, p. 172; RATHBUN, 1907, p. 29 (Easter Island); 1918, p. 234, pl. 36; GARTH, 1957, p. 94 (synonymy).

Leptograpsus ansoni MILNE EDWARDS, 1853, p. 171 (Juan Fernandez Island).

PREVIOUS COLLECTIONS. Easter Island, shore, 16, 20 December 1904, 3 males, 5 females. La Pérouse Bay, 17 December 1904, 7 males, 5 females, *Albatross* (Rathbun, 1907). The single male reported by Rathbun (1907) with the date of 21 December 1899, is not presently on record at the U. S. National Museum and may have been part of a collection not involving the *Albatross*, which on the date in question was at sea between Fiji and Funafuti in the Ellice Islands on an earlier cruise that did not stop at Easter Island (F. A. Chace, Jr., personal communication).

MATERIAL EXAMINED. Near Hanga-Roa, Station F 42, 25-26 December 1964, 2 males, 1 female, collected by children. Vaihu, Station F 94, 25 January 1965, rotenone collection in 6 to 10 feet of water, 1 male, soft shell, Ian E. Efford and Jack A. Mathias. Hanga-Roa, 5 February 1965, 1 female, without chelipeds, Ian E. Efford and Jack A. Mathias. Hanga-Roa Tai, 5 August 1972, 1 male, H. I. Moyano.

MEASUREMENTS. Males measure from 21.8×24.5 to 43.5×50.5 mm., ovigerous female 30.1×34.2 mm., non-ovigerous female 44.2×49.8 mm. in length and width of carapace, respectively.

DISTRIBUTION. Australia and New Zealand in the western Pacific; Easter Island and Juan Fernandez Island in the eastern Pacific; Peru and Chile on the west coast of South America.

REMARKS. In sub-tropical southern hemisphere areas from which *Grapsus grapsus* (Linnaeus) is absent, its dominance of the upper intertidal of rocky shores is assumed by *Leptograpsus variegatus*. It is therefore probable that the crabs observed in 1770 by Don Juan Hervé (1908, p. 122) and mentioned in the introduction of this paper were of this species, although the fact that he referred to them as small crabs might indicate *Pachygrapsus transversus* (Gibbes) instead. Unlike *Grapsus grapsus*, which keeps to the supra-tidal level, *Leptograpsus variegatus* was reported by Lund University Chile Expedition collectors both in rocky crevices around high water level and in quiet water between boulders in the lower part of the littoral (Garth, 1957). Its presence in from 6 to 10 feet of water at Easter Island would support the latter observation.

Pachygrapsus transversus (Gibbes).

Grapsus transversus GIBBES, 1850, p. 181.

Pachygrapsus transversus, GIBBES, 1850, p. 182; RATHBUN, 1902, p. 279 (Galápagos); 1907, p. 29 (Easter Island); 1918, p. 244, pl. 61, figs. 2, 3, synonymy.

PREVIOUS COLLECTION. Easter Island, shore, 16 December 1904, 1 female, *Albatross* (Rathbun, 1907).

MATERIAL EXAMINED. Hanga-Roa, 23 December 1964, 1 male, Ian E. Efford and Jack A. Mathias. Hanga-piko, tide pool, Station M 10, 31 December 1964, 2 males, Ian E. Efford and Jack A. Mathias. Vaihu, tide pool, 3 January 1965, 3 males, 2 females, Ian E. Efford and Jack A. Mathias.

MEASUREMENTS. Males measure from 5.2×6.3 to 11.8×14.5 mm., females 5.2×6.6 and 6.0×7.7 mm. in length and width of carapace, respectively.

DISTRIBUTION. West coast of America from Gulf of California to Peru; Galápagos Islands; Easter Island. East coast of America from Florida to Uruguay; Bermuda. West coast of Africa from Mediterranean to northern Angola; Cape Verde Islands.

REMARKS. Since the Indo-west Pacific species of *Pachygrapsus*, *P. planifrons* De Man and *P. minutus* A. Milne Edwards, were encountered by the Scripps International Geophysical Year (IGY) Expedition at Clipperton Island (Garth, 1965), it was with interest that the writer verified from freshly collected METEI material the Easter Island record (Rathbun, 1907) of the amphi-American species, *P. transversus* (Gibbes). Thus, in the eastern North Pacific, as at Clipperton and Clarion islands, it is the western Pacific *Pachygrapsus* species

that have gained foothold; in the eastern South Pacific, as at Galápagos and Easter islands, it is a New World *Pachygrapsus* species that has established itself.

***Ptychognathus easteranus* Rathbun.**

Ptychognathus easterana RATHBUN, 1907, p. 31, pl. 2, fig. 4; pl. 7, figs. 4, 4a (Easter Island).

PREVIOUS COLLECTION. Easter Island, shore, 20 December 1904, 1 male, *Albatross* (Rathbun, 1907).

MATERIAL EXAMINED. Hanga-piko, tide pool, Station M 10, 31 December 1964, 1 young female, Ian E. Efford and Jack A. Mathias.

MEASUREMENTS. Young female: length of carapace 4.2 mm., width 5.0 mm. The male holotype (USNM No. 32845) measured 10.6 mm. in length and 12.7 mm. in width of carapace (Rathbun, 1907).

DISTRIBUTION. Known only from Easter Island, where it was first collected by the U. S. Fish Commission Steamer *Albatross* in 1904. The genus ranges throughout the Indo-west Pacific.

REMARKS. The single young female collected by the METEI differs from the male holotype in being more straight-sided, thereby increasing its resemblance to *Ptychognathus polleni* De Man (1895, p. 94, pl. 28, fig. 20a), and would not have been recognized as the same species as the male except for the external maxilliped, which is identical with the figure of Rathbun (1907).

***Cyclograpsus longipes* Stimpson.**

Cyclograpsus longipes STIMPSON, 1858, p. 105 (Bonin Islands); DE MAN, 1896, p. 355, pl. 32, figs. 43a-c (Atjeh); RATHBUN, 1907, p. 36 (Tahiti, Tuamotu); SAKAI, 1939, p. 690, synonymy; CAMPBELL and GRIFFIN, 1966, p. 139, key.

MATERIAL EXAMINED. Shore above Vaihu, 25 January 1965, 2 males, 1 female, Ian E. Efford and Jack A. Mathias.

MEASUREMENTS. Male specimens: 4.6×5.7 and 5.4×7.0 mm.; female specimen: 7.0×8.8 mm.

DISTRIBUTION. Sumatra (Atjeh = Achin), Bonin Islands, Fiji Islands, Tahiti, and Tuamotu.

REMARKS. According to Campbell and Griffin (1966). *Cyclograpsus longipes* is distinguished from other *Cyclograpsus* species with entire anterolateral margins by having the lateral margins of the carapace straight and markedly divergent posteriorly, the epigastric lobes prominent, and the suborbital ridge interrupted two or three times. The Easter Island female differs from the two males in lacking the felted patch on the propodus of the second pair of walking legs and in having the suborbital ridge entire. In this respect it agrees with a larger series of eight males and three females from the Marshall Islands in the collections of the Allan Hancock Foundation.

Plagusia dentipes De Haan.

Plagusia dentipes DE HAAN, 1835, p. 58, pl. 8, fig. 1 (Japan); RATHBUN, 1907, p. 36 (Easter Island); SAKAI, 1939, p. 79, fig. 3, synonymy.

PREVIOUS COLLECTION. Easter Island, shore, 21 December 1904, 2 males, 1 female, *Albatross* (Rathbun, 1907).

MATERIAL EXAMINED. Easter Island, near camp, January 1965, 1 male, 1 female, Ian E. Efford and Jack A. Mathias.

MEASUREMENTS. Male specimen: length of carapace 38.5 mm., width 41.6 mm.; female specimen: length 34.4 mm., width 36.7 mm.

DISTRIBUTION. Japan and Formosa. Easter Island. Any continuity between the two regions must be assumed, as records from intermediate localities are lacking.

REMARKS. The Easter Island specimens, while large, are not as large as a male from Simoda, length of carapace 44 mm., width 59.5 mm. (Sakai, 1939). Easter Island specimens were seen by Dr. Sakai, who confirmed their identity with Japanese specimens. The writer also had the privilege of examining two male and one female syntypes of von Siebold's collecting in the collections of the Leiden Museum.

Plagusia integripes Garth, new species.

(Figures 1-6.)

TYPE. Female holotype (AHF No. 6511), from shallow water off Hanga-Roa, Easter Island, 2 February 1965, Ian E. Efford and Jack A. Mathias, collectors (METEI).

MEASUREMENTS. Female holotype: length of carapace 30.2 mm., width of carapace 31.1 mm., of front 6.2 mm., between inner orbital spines 12.2 mm., between exorbital spines 19.7 mm., length of chela 15.0 mm., of dactyl 8.4 mm.

DIAGNOSIS. Carapace tuberculate; three teeth behind external orbital angle. Coxae of walking legs entire; meri smooth anteriorly, a single spine subterminally. Exognath of outer maxilliped without a flagellum.

DESCRIPTION. Carapace roughened everywhere by low scabrous tubercles arranged in transverse rows and becoming more prominent on the slopes of the major elevations; intervening depressions free of tubercles but filled with a tomentum of short, stout, hooked hairs directed forward and inward. Larger tubercles distributed as follows: two pairs on the front, forming a square; one behind the orbit, one outer branchial, and one post lateral, each with one or more subordinate tubercles. Front with about eight tubercles on each side arranged in a forward-curving arc, the anterior three independent, the posterior five coalesced; a blunt tooth on outer slope of inner orbital lobe. Anterolateral border with four strong teeth, including the exorbital tooth; teeth acute, directed forward, upward, and slightly inward, separated by broad U-shaped sinuses, and decreasing in size from first to last; last tooth considerably smaller than the

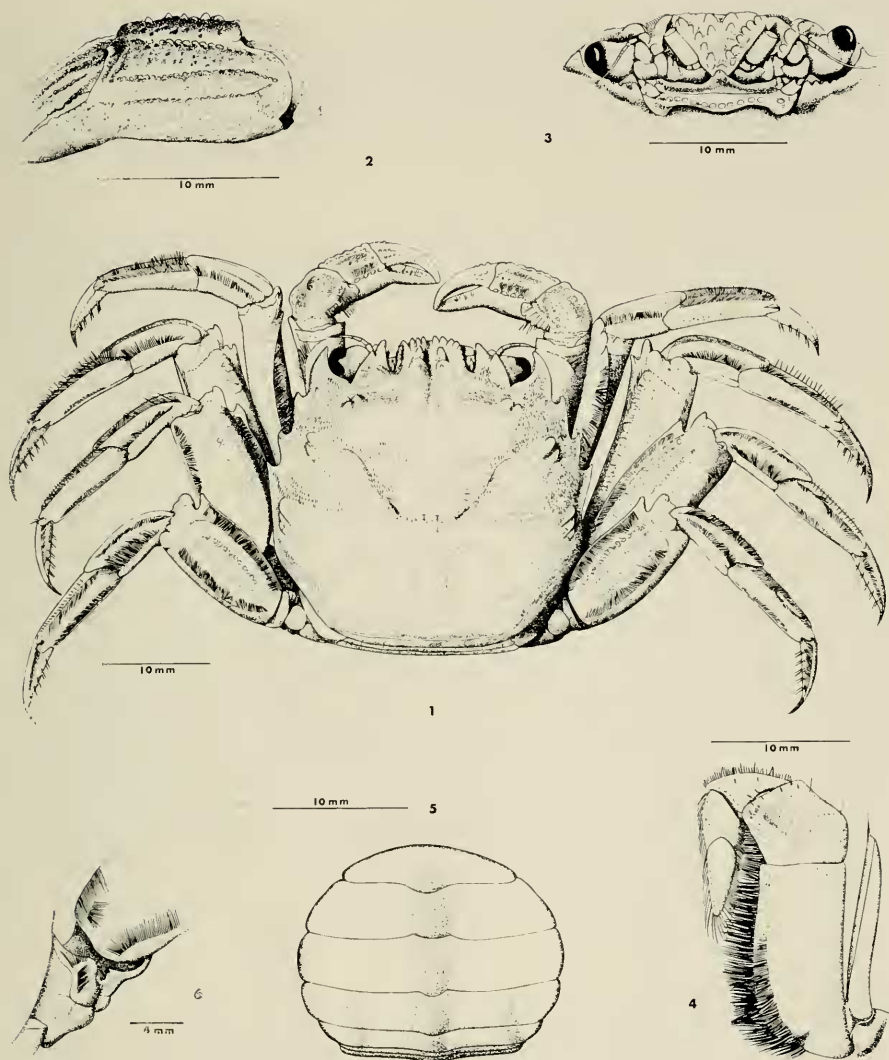


FIGURE 1. *Plagusia integripes* Garth, new species, female holotype (AHF No. 6511), dorsal view. FIGURE 2. Same, outer view of left cheliped. FIGURE 3. Same, frontal view of orbital region. FIGURE 4. Same, left outer maxilliped. FIGURE 5. Same, abdomen, restored. FIGURE 6. Same, coxa of right third leg. Drawings by Carl Petterson.

preceding tooth. Lower orbital margin continuous with epistome and similarly denticulate; epistome not readily divisible into lobes. Merus of outer maxilliped with a groove parallel to obliquely truncated anteroexternal margin; exognath lacking a flagellum.

Chelipeds of the female (the male is not known) moderately robust, equal,

tuberculate, and hairy; tubercles forming a weak crest backed by feathered setae along inner margins of merus, carpus, and manus, irregularly arranged on upper surface of carpus and manus, and forming rows along ridges leading to the dactyls on outer surface of palm; dactyls basally tuberculate, movable finger grooved, tips hollowed and meeting with a slight gape; hooked hairs in depressions of carpus and manus.

Merus of walking legs with anterior crest entire, terminating in an acute spine or tubercle, fringed with plumose setae, and paralleled by a superior row of low tubercles; carpus and propodus similarly crested and fringed but lacking subterminal spine; dactylus short, curved, a double row of bristles internally, fringing hairs externally. Coxal lobes entire.

Abdomen of unique female holotype crushed, but clearly showing the 7-segmented arrangement as restored in figure 5.

REMARKS. The new species from Easter Island allies itself with *Plagusia depressa* (Fabricius), *P. glabra* Dana, and *P. speciosa* Dana in having the meri of the walking legs smooth anteriorly and culminating in a single spine. Like them also it lacks the flagellum of the exognath of the third maxilliped found in *Plagusia capensis* De Haan and *P. dentipes* De Haan but in its place carries a tuft of setae. It may be distinguished from *Plagusia depressa* in all its forms by the denticulate lower margin of the orbit and inner margins of the merus, carpus, and propodus of the cheliped, the corresponding surfaces in that species being entire; by the flatter, more squarish carapace with clusters of sharp tubercles separated by patches of hooked setae, rather than low squamiform tubercles fringed with soft hair; and by the more robust chelae, at least in the female sex, the male of the species being unknown; and from *P. d. depressa* by the entire coxa of the walking legs (fig. 6), that of the nominate form being bidentate (cf. Rathbun, 1918, text-fig. 154a).

The ♀ holotype from Easter Island has been compared with each of the following:

TYPE MATERIAL.

Plagusia chabrus (Linnaeus), ♀ neotype from Cape of Good Hope, H. B. van Horstok; *Plagusia capensis* De Haan, ♀ lectotype from Cape of Good Hope, H. B. van Horstok; the above one and the same specimen in the Leiden Museum. (cf. Griffin, 1968)

Plagusia gaimardi Milne Edwards, ♂ type from Tongatabu, Quoy and Gaimard; *Plagusia tomentosa* Milne Edwards, 3 ♂ and 1 ♀ syntypes, Cape of Good Hope, attributed to Latreille; 1 ♀ syntype, Cape of Good Hope, Delalande; both in the Paris Museum. [The above three probably synonyms of *Plagusia chabrus*.]

Plagusia dentipes De Haan, 2 ♂ and 1 ♀ syntypes, Japan, P. F. von Siebold, in the Leiden Museum.

OTHER MATERIAL.

Plagusia capensis De Haan, ♂ and ♀ from Long Reef, Collaroy, New South Wales; *Plagusia dentipes* De Haan, ♂ and ♀ from Easter Island; *Plagusia depressa* (Fabricius), ♂ and ♀ from Cubagua Island, Venezuela;

Plagusia depressa immaculata Lamarck, ♂ and ♀ from Cocos Island, Costa Rica;
Plagusia depressa tuberculata Lamarck, ♀ from Iheya Shima, Ryukyu Islands;
Plagusia speciosa Dana, ♀ from Apra Harbor, Guam; ♀ from Clipperton Island. The above
 are in the collections of the Allan Hancock Foundation.

Plagusia glabra Dana, ♂ and ♀ from Cogee, near Sydney, New South Wales. The above
 courtesy of The Australian Museum, Sydney.

ZOOGEOGRAPHY

The study of the Brachyura of the METEI clearly establishes Easter Island as the most easterly outpost of the Indo-west Pacific marine fauna in the South Pacific. As such it is comparable to Clipperton Island, an atoll at the same Longitude in the North Pacific, a relationship developed through the study of the Brachyura of the Scripps IGY Expedition (Garth, 1965).

Easter Island species with ranges extending westward to the western margins of the Indian Ocean are the following:

<i>Dromidia unidentata</i> (Rüppell)	Red Sea, East Africa
<i>Carpilius convexus</i> (Forskål)	Red Sea, South Africa
<i>Liomera rugata</i> (Milne Edwards)	Red Sea, Mauritius
<i>Actaea parvula</i> (Krauss)	Red Sea, Natal
<i>Lophozozymus dodone</i> (Herbst)	East Africa, Mauritius
<i>Etisus electra</i> (Herbst)	Red Sea, Mozambique
<i>Chlorodiella cytherea</i> (Dana)	Red Sea, Madagascar
<i>Trapezia cymodoce</i> (Herbst)	Red Sea, Dar-es-Salaam
<i>Trapezia ferruginea</i> Latreille	Red Sea, Zanzibar
<i>Geograpsus crinipes</i> (Dana)	Red Sea, Madagascar.

Species with range extending westward to the Central Indian Ocean are the following:

<i>Pseudoliomera remota</i> Rathbun	Coetivy, Salomon
<i>Trapezia areolata</i> Dana	Ceylon, Nicobar Islands
<i>Trapezia danai</i> Ward.	

Species with ranges extending westward to the western margins of the Pacific Ocean are the following:

<i>Portunus pubescens</i> (Dana)	Australia, Japan
<i>Thalamita</i> species	
<i>Leptograpsus variegatus</i> (Fabricius)	Australia, New Zealand
<i>Cyclograpsus longipes</i> Stimpson	Sumatra, Bonin Islands
<i>Plagusia dentipes</i> De Haan	Japan, Formosa.

Species apparently endemic to Easter Island but representing Indo-west Pacific or Pan-tropical genera are the following:

<i>Ptychognathus casteranus</i> Rathbun	<i>Plagusia integripes</i> Garth, new species
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Species with ranges extending eastward to the shores of the Americas are the following:

<i>Trapezia ferruginea</i> Latreille	Galápagos Islands, Bay of Panama
<i>Leptograpsus variegatus</i> (Fabricius)	Juan Fernandez Island, Chile
<i>Pachygrapsus transversus</i> (Gibbes)	Galápagos Islands, Peru

It will be noted that the largest single segment are those that have negotiated the distance from the Red Sea to Easter Island, representing 210° of Longitude, or three-fifths of the circumference of the globe; also that the second largest segment are those that have negotiated the distance from Australia to Easter Island, representing 95° of Longitude, or one quarter of the circumference of the globe. On the other hand, only three species have successfully negotiated the distance from Chile to Easter Island, representing but 40° of Longitude, or one-ninth the circumference of the globe, and of these only one species, *Pachygrapsus transversus* (Gibbes), appears to have made the crossing from east to west, since it alone has incontestible New World affinities. That the migration has proceeded predominantly in an easterly direction is apparent by the increasing impoverishment of Pacific islands in Asiatic species from west to east, without a corresponding enrichment in American species. In the case of the *Pachygrapsus* species, which are susceptible to transport by ships' hulls and condensers, chance has determined the arrival and survival of *P. transversus* at Galápagos and Easter Island, as also of the western Pacific *P. planifrons* De Man and *P. minutus* A. Milne Edwards at Clarion and Clipperton in the northern hemisphere (Garth, 1965), again underscoring the randomness of insular dispersal.

The nearest islands to the west from which brachyuran species may have reached Easter Island are Tahiti and Tuamotu. Fortunately, the fauna of these islands is comparatively well known through the recent monograph of Forest and Guinot (1961).

Species common to islands immediately to the west of Easter Island are the following:

<i>Carpilius convexus</i> (Forskål)	Tahiti, Tuamotu
<i>Thalamita</i>	
<i>Liomera rugata</i> (Milne Edwards)	Tahiti, Tuamotu (Fakarava)
<i>Actaea parvula</i> (Krauss)	Marquesas
<i>Lophozymus dodone</i> (Herbst)	Tahiti
<i>Etius electra</i> (Herbst)	Tahiti, Tuamotu (Manga Reva)
<i>Chlorodiella cytherea</i> (Dana)	Tahiti, Tuamotu
<i>Trapezia areolata</i> Dana	Tuamotu (Hikueru = Melville)
<i>Trapezia cyndoce</i> (Herbst)	Tahiti, Marquesas
<i>Trapezia ferruginea</i> Latreille	Tahiti, Marquesas
<i>Cyclograpsus longipes</i> Stimpson	Tahiti, Tuamotu.

There remain to be considered three species known only from localities remote from Easter Island, rather than from adjacent islands. These are *Dromidia unidentata* (Rüppell), known in the Pacific from Japan, Hawaii, and the Kermadec Islands; *Portunus pubescens* (Dana), known from Japan, Hawaii, the Line Islands, and Australia; and *Plagusia dentipes* De Haan, known from Japan and Formosa. The Marquesas Islands, mentioned above, suggest a possible migration route, since they lie northwest of Easter Island along an axis which, if projected, leads through the Line Islands (Christmas, Fanning, Washington, and Palmyra) to Johnston and Midway islands, west of Hawaii. Such a direct dispersal route seems highly improbable, however, since it cuts across major ocean currents. The writer is inclined to favor, at least for the first two species mentioned, a southern hemisphere dispersal route eastward from Australia and would suggest a series of island stepping-stones for current-borne larval stages lying south of the Tropic of Capricorn: Lord Howe, Norfolk, Kermadec, Rapa, Morotiri (Bass), Pitcairn, Henderson, and Ducie. This island arc is completed to South America by Sala y Gomez, San Felix, and San Ambrosio. Juan Fernandez Islands, lying south as well as east of Easter Island, have but one brachyuran species found also at Easter Island, according to Balss (1924): *Leptograpsus variegatus* (Fabricius). The southern hemisphere island arc is much more probably involved in its trans-Pacific distribution than the hypothetical southern continent to which Balss (1924), following Arldt (1907, p. 114), took recourse. Evidence is constantly mounting to show that planktonic larvae of benthonic species, propelled by powerful currents, span greater oceanic distances than were once believed possible (Garth, 1966; Briggs, 1967; Scheltema, 1968). Certainly, of all Pacific islands, with the possible exception of Clipperton in the north Pacific, the sweepstakes route to Easter Island puts this hypothesis to its severest test.

LITERATURE CITED

AGASSIZ, A.

1906. Reports on the scientific results of the expedition to the eastern tropical Pacific, . . . by the U. S. Fish Commission Steamer "Albatross," from October, 1904, to March, 1905. . . V. General report of the expedition. Memoirs of the Museum of Comparative Zoölogy at Harvard College, vol. 33, pp. (xiii) 1-75.

ALCOCK, A.

1898. Materials for a carcinological fauna of India. No. 3. The Brachyura Cyclometopa. Part I. The family Xanthidae. Journal of the Asiatic Society of Bengal, vol. 67, pp. 67-233.
1900. Materials for a carcinological fauna of India. No. 5. The Brachyura Primigenia, or Dromiacea. Journal of the Asiatic Society of Bengal, vol. 68 (for 1899), pp. 123-169.

ARLDT, T.

1907. Die Entwicklung der Kontinente und ihrer Lebewelt. Ein Beitrag zur vergleichenden Erdgeschichte, pp. (xvii) 1-729. Leipzig.

BALSS, H.

1924. Decapoden von Juan Fernandez. *In*: C. Skottsberg (ed.), The natural history of Juan Fernandez and Easter Island, vol. 3, pp. 329-340. Uppsala.
1938. Die Dekapoda Brachyura von Dr Sixten Bocks Pazifik-Expedition 1917-1918. Göteborgs Kungl. Vetenskaps- och Vitterhets-Samhälles Handlingar, femte följdén, ser. B, Band 5, no. 7, pp. 1-85.

BARNARD, K. H.

1950. Descriptive catalogue of South African decapod Crustacea. *Annals of the South African Museum*, vol. 38, pp. 1-837.

BOONE, LEE

1927. The littoral crustacean fauna of the Galapagos Islands. I. Brachyura. *Zoologica*, vol. 8, pp. 127-288.
1934. Scientific results of the world cruise of the yacht "Alva," 1931, . . . Crustacea: Stomatopoda and Brachyura. *Bulletin of the Vanderbilt Marine Museum*, vol. 5, pp. 1-210.

BRIGGS, J. C.

1967. Relationship of the tropical shelf regions. *Studies in Tropical Oceanography*, vol. 5, pp. 569-578.

CAMPBELL, B. M., and D. J. G. GRIFFIN

1966. The Australian Sesarminae (Crustacea: Brachyura): genera *Helice*, *Helograpsus* nov., *Cyclograpsus*, and *Paragrapsus*. *Memoirs of the Queensland Museum*, vol. 14, pp. 127-174.

CHILTON, C.

1911. The Crustacea of the Kermadec Islands. *Transactions of the New Zealand Institute*, vol. 43 (for 1910), pp. 544-573.

DANA, J. D.

1851. Conspectus crustaceorum quae in orbis terrarum circumnavigatione, Carolo Wilkes e classe Reipublicae Foederatae duce, lexit et descripsit J. D. Dana. *Proceedings of the Academy of Natural Sciences of Philadelphia*, vol. 5, pp. 247-254; 267-272.
- 1852a. [Same title.] *Proceedings of the Academy of Natural Sciences of Philadelphia*, vol. 6, pp. 73-86.
- 1852b. Crustacea. *In*: United States Exploring Expedition during the years 1838, 1839, 1840, 1841, 1842, under the command of Charles Wilkes, U.S.N., vol. 13, pp. (viii) 1-685. Philadelphia.
1855. [Same title.] vol. 14, Atlas, pp. 1-27, pls. 1-96.

EDMONDSON, C. H.

1922. Hawaiian Dromiidae. *Occasional Papers of Bernice P. Bishop Museum*, vol. 8, pp. 31-38.
1923. Crustacea from Palmyra and Fanning Islands. *Bernice P. Bishop Museum Bulletin*, no. 5, pp. 1-43.
1954. Hawaiian Portunidae. *Occasional Papers of Bernice P. Bishop Museum*, vol. 21, pp. 217-274.
1959. Hawaiian Grapsidae. *Occasional Papers of Bernice P. Bishop Museum*, vol. 22, pp. 153-202.
1962. Xanthidae of Hawaii. *Occasional Papers of Bernice P. Bishop Museum*, vol. 22, pp. 215-309.

FABRICIUS, J. C.

1793. *Entomologia systematica emendata et aucta secundum classes, ordines, genera,*

species, adjectis synonymis, locis, observationibus, descriptionibus, vol. 2, pp. (viii) 1-519. Hafniae.

FOREST, J., and DANIELÉ GUINOT

1961. Crustacés Décapodes Brachyours de Tahiti et des Tuamotu. Expédition française sur les récifs coralliens de la Nouvelle-Calédonie. Volume préliminaire, pp. 1-195. Paris.

FORSKÅL, P.

1775. Descriptiones animalium avium, amphibiorum, piscium, insectorum, vermium, quae in itinere Orientali observavit P. Forskål . . . post mortem auctoris editit C. Niebuhr, pp. 1-164, 1 map. Hauniae. [Not seen.]

GARTH, J. S.

1957. Reports of the Lund University Chile Expedition 1948-49. No. 29. The Crustacea Decapoda Brachyura of Chile. Lunds Universitets Årsskrift, n. f., Avd. 2, Bd. 53, Nr. 7, pp. 1-128.
1965. The brachyuran decapod crustaceans of Clipperton Island. Proceedings of the California Academy of Sciences, ser. 4, vol. 33, pp. 1-46.
1966. On the oceanic transport of crab larval stages. Marine Biological Association of India, Proceedings of the Symposium on Crustacea, vol. 1, pp. 443-448.
1971. Borradaile's Maldivian collections revisited. Journal of the Marine Biological Association of India, vol. 11, pp. 182-190.

GERSTAECKER, C. E. A.

1857. Carcinologische Beiträge. Archiv für Naturgeschichte, vol. 22 (for 1856), pp. 101-162.

GIBBES, L. R.

1850. On the carcinological collections of the United States and an enumeration of the species contained in them, with notes on the most remarkable, and descriptions of new species. Proceedings of the American Association for the Advancement of Science, vol. 3, pp. 167-201.

GRIFFIN, D. J. G.

1968. The designation of a neotype for *Cancer chabrus* Linnaeus and the status of *Plagusia capensis* De Haan (Decapoda, Grapsidae). Crustaceana, vol. 15, pp. 209-213.

GUINOT, DANIELÉ

1962. Sur une collection de Crustacés Décapodes Brachyours des îles Maldives et de Mer Rouge (Expédition "Xarifa" 1957-1958). Kieler Meeresforschungen, vol. 18, pp. 231-244.
1964. Crustacés Décapodes Brachyours (Xanthidae) des campagnes de la Calypso en Mer Rouge (1952), dans le Golfe Persique et à l'Île Aldabra (1954). Mémoires du Muséum National d'Histoire Naturelle, nouvelle série, Série A, Zoologie, vol. 32, fasc. 1, pp. 1-108 (iii).
1967. Recherches préliminaires sur les groupements naturels chez les Crustacés Décapodes Brachyours. III. A propos des affinités des genres *Dairoides* Stebbing et *Daira* De Haan. Bulletin du Muséum National d'Histoire naturelle, ser. 2, vol. 39, pp. 540-563.
1969. Sur divers Xanthidae, notamment sur *Actaea* De Haan et *Paractaea* gen. nov. (Crustacea Decapoda Brachyura). Cahiers du Pacifique, no. 13, pp. 222-267

HAAN, W. DE

- 1833-1850. Crustacea. In: P. F. von Siebold, Fauna Japonica, pp. (xvi) (xxx) 1-244. Lugduni Batavorum. [For dates of publication see Holthuis, L. B., 1953,

Journal of the Society for the Bibliography of Natural History, vol. 3, pp. 36-47.]

HASWELL, W. A.

1882. On some new Australian Brachyura. Proceedings of the Linnaean Society of New South Wales, vol. 6, pp. 540-551.

HELLER, C.

1862. Neue Crustaceen, gesammelt während der Weltumseglung der k. k. Fregatte "Novarra". Zweiter vorläufiger Bericht. Verhandlungen der kaiserlich-königlichen zoologisch-botanischen Gesellschaft in Wien, vol. 12, pp. 519-528.
1865. Crustaceen. Reise der österreichischen Fregatte Novara um die Erde in den Jahren 1857, 1858, 1859 unter den Befehlen des Commodore B. von Wüllerstorff-Urbair. Zoologischer Theil, zweiter Band, III. Abtheilung, pp. 1-280.

HERBST, J. F. W.

1801. Versuch einer Naturgeschichte der Krabben und Krebse, nebst einer systematischen Beschreibung ihrer verschiedenen Arten, vol. 3, pt. 2, pp. 1-46. Berlin and Stralsund.

HERTLEIN, L. G., and W. K. EMERSON

1957. Additional notes on the invertebrate fauna of Clipperton Island. American Museum Novitates, no. 1859, pp. 1-9.

HERVÉ, J.

1908. Narrative of the expedition undertaken by order of His Excellency Don Manuel de Amat, Viceroy of Peru, in the ship San Lorenzo and the frigate Santa Rosalia, from the harbour of El Callao de Lima to the island of David, in 1770. In: B. C. Corney (ed.), The voyage of Captain Don Felipe González in the ship of the line San Lorenzo, with the frigate Santa Rosalia in company, to Easter Island in 1770-1. Works of the Hakluyt Society, vol. 2, pp. (lxxvii) 1-176. Cambridge.

HOLTHUIS, L. B.

1953. Enumeration of the decapod and stomatopod Crustacea from Pacific coral islands. Atoll Research Bulletin, vol. 24, pp. 1-66. [Mimeographed.]

IHLE, J. E. W.

1913. Die Decapoda Brachyura der Siboga-Expedition. I, Dromiacea. Siboga-Expeditie, monogr. 39b, livr. 71, pp. 1-96.

JACQUINOT, H.

1852. In: Hombron et Jacquinot, Voyage au Pôle Sud et dans l'Océanie sur les corvettes "L'Astrolabe" et "La Zélée" pendant les années 1837-1838-1839-1840 sous le commandement de M. Dumont d'Urville. . . Zoologie, Atlas, Crustacés, pls. 1-9.

JACQUINOT, H., and H. LUCAS

1853. [Same title.] 3. Crustacés, pp. 1-107.

KLUNZINGER, C. B.

1913. Die Rundkrabben (Cyclometopa) des Roten Meeres. Nova Acta Akademie der Naturforscher Leopoldina-Carolina, Halle, vol. 99, pp. 97-402.

KOSSMANN, R.

1880. Zoologische Ergebnisse einer im Auftrage der königlichen Academie der Wissenschaften zu Berlin ausgeführten Reise in die Küstengebiete des Rothen Meeres. Zweite Hälfte, III. Malacostraca (II Theil: Anomura), pp. 67-140. Leipzig.

KRAUSS, F.

1843. Die Südafrikanischen Crustaceen. Eine Zusammenstellung aller bekannten Mala-

costraca, Bemerkungen über deren Lebensweise und geographische Verbreitung, nebst Beschreibung und Abbildung mehrerer neuen Arten, pp. 1-68. Stuttgart.

LATREILLE, P. A.

1825. Trapézie. *Encyclopédie méthodique: Entomologie, ou Histoire naturelle des Crustacés, des Arachnides et des Insectes.* vol. 10, pp. 695-696.

LENZ, H.

1910. Crustaceen von Madagaskar, Ostafrika und Ceylon. *In: A. Voeltzkow, Reise in Ostafrika in den Jahren 1903-1905. . . ausgeführt von. . . A. Voeltzkow. Wissenschaftliche Ergebnisse,* vol. 2, Heft 5, pp. 539-576. Stuttgart.

MAN, J. G. DE

1895. Bericht über die von Herrn Schiffscapitän Storm zu Atjeh, an den westlichen Küsten von Malakka, Borneo und Celebes sowie in der Java-See gesammelter Decapoden und Stomatopoden. *Zoologische Jahrbücher, Abtheilung für Systematik,* vol. 9, pp. 75-218.

1896. [Same title.] *Zoologische Jahrbücher, Abtheilung für Systematik,* vol. 9, pp. 339-386.

MILNE EDWARDS, A.

1865. Études zoologiques sur les Crustacés récents de la famille des Cancériens. Première Partie. Cancérides. Pirméclides. Carpilides. *Nouvelles Archives du Muséum d'Histoire Naturelle,* Paris, vol. 1, pp. 177-308.

1873. Recherches sur la faune carcinologique de la Nouvelle-Calédonie. II. Cyclometopes. *Nouvelles Archives du Muséum d'Histoire Naturelle,* Paris, vol. 9, pp. 155-332.

MILNE EDWARDS, H.

1853. Mémoire sur la famille des Ocypodiens. *Annales des Sciences Naturelles, sér. 3, Zoologie,* vol. 20, pp. 163-228.

NOBILI, G.

1907. Ricerche sui Crostacei della Polinesia. *Memorie della Reale Accademia delle Scienze di Torino, ser. 2,* vol. 57, pp. 351-430.

ODHNER, T.

1925. Monographierte Gattungen der Krabbenfamilie Xanthidae. I. Göteborgs Kungl. Vetenskaps- och Vitterhets- Sämhalles Handlingar, Fjärde följden, vol. 29, no. 1, pp. 1-92.

ORTMANN, A. E.

1893. Die Decapoden-Krebse des Strassburger Museums. VII. Brachyura. II. Cyclometopa. *Zoologische Jahrbücher, Abtheilung für Systematik, Geographie und Biologie der Thiere,* vol. 7, pp. 411-495.

1894. Die Decapoden-Krebse des Strassburger Museums. VIII. Brachyura. III. Catometopa. *Zoologische Jahrbücher, Abtheilung für Systematik,* vol. 7, pp. 683-772.

1897. Die geographische Verbreitung der Decapoden-Familie Trapeziidae. *Zoologische Jahrbücher, Abtheilung für Systematik,* vol. 10, pp. 201-216.

RATHBUN, MARY J.

1902. Papers from the Hopkins-Stanford Expedition, 1898-1899. VIII. Brachyura and Macrura. *Proceedings of the Washington Academy of Sciences,* vol. 4, pp. 275-292.

1906. The Brachyura and Macrura of the Hawaiian Islands. *Bulletin of the United States Fish Commission,* vol. 23 (for 1903), pp. 827-930.

1907. Reports on the Scientific results of the expeditions to the tropical Pacific . . . by the United States Fish Commission Steamer "Albatross". . . IX, X. The



- Brachyura. Memoirs of the Museum of Comparative Zoölogy at Harvard College, vol. 35, pp. 23-74.
1911. The Percy Sladen Trust Expedition to the Indian Ocean in 1905, under the leadership of Mr. J. Stanley Gardiner. XI. Marine Brachyura. Transactions of the Linnaean Society of London, ser. 2, Zoology, vol. 14, pp. 191-261.
1918. The grapsoid crabs of America. United States National Museum, bull. 97, pp. (xxii) 1-461.
1930. The cancroid crabs of America of the families Euryalidae, Portunidae, Atelecydidae, Cancridae, and Xanthidae. United States National Museum, bull. 152, pp. (xvi) 1-609.
- RÜPPELL, E. S.
1830. Beschreibung und Abbildung von 24 Arten kurzschwänzigen Krabben, als Beitrag zur Naturgeschichte des Rothen Meeres. Pp. 1-28. Frankfurt am Main. [Not seen.]
- SAKAI, T.
1934. Brachyura from the coast of Kyushu, Japan. Science Reports of the Tokyo Bunrika Daigaku, sect. B, vol. 1, pp. 281-330.
1936. Studies on the crabs of Japan. I. Dromiacea. Science Reports of the Tokyo Bunrika Daigaku, sect. B, vol. 3, suppl. 1, pp. 1-66.
1939. [Same title.] IV. Brachygnatha, Brachyrhyncha. Pp. 365-741. Tokyo.
- SCHIELTEMA, R. S.
1968. Dispersal of larvae by equatorial ocean currents and its importance to the zoogeography of shoal-water tropical species. Nature, vol. 217, pp. 1159-1162.
- SERÈNE, R.
1969. Observations on species of the group *Trapezia rufopunctata-maculata*, with a provisional key for all the species of *Trapezia*. Journal of the Marine Biological Association of India, vol. 11, pp. 126-148.
- STEPHENSON, W., and B. CAMPBELL
1959. The Australian portunids (Crustacea: Portunidae). III. The genus *Portunus*. Australian Journal of Marine and Freshwater Research, vol. 10, pp. 84-124.
- STIMPSON, W.
1858. Prodomus descriptionis animalium evertibratorum quae in Expeditione ad Oceanum Pacificum Septentrionalem, a Republica Federata missa, Cadwaladaro Ringgold et Johanne Rodgers Ducibus, observavit et descripsit. V. Crustacea Ocyphodoidea. Proceedings of the Academy of Natural Sciences of Philadelphia, vol. 10, pp. 93-110.
1860. Notes on North American Crustacea in the Museum of the Smithsonian Institution. II. Annals of the Lyceum of Natural History of New York, vol. 7, pp. 176-246.
- WARD, M.
1939. The Brachyura of the Second Templeton Crocker-American Museum Expedition to the Pacific Ocean. American Museum Novitates, no. 1049, pp. 1-15.